## Claims

1. A method for multiplying and differentiating cells in vitro, characterized in that the growth process of the cells is initiated and terminated, and structurally guided, through the use of the growth factors thrombopoietin (TPO) and/or erythropoietin (EPO), and/or growth hormone (GH), in particular human growth hormone (HGH), and/or somatostatin and/or leukemia inhibitory factor (LIF) and/or ciliary neurotropic factor (CNTF).

2. The method as claimed in claim 1, characterized in that transforming growth factor beta (TGF beta), prostaglandins, granulocyte-macrophage stimulating factor (GM-CSF), growth hormone releasing hormone (GHRH), thyrotropin-releasing hormone (TRH), gonadotropin-releasing hormone (GnRH), corticotropin-releasing hormone (CRH), dopamine, antidiuretic hormone (ADH), oxytocin, prolactin, adrenocorticotropin, beta-celltropin, lutrotropin and/or vasopressin is employed additionally as growth factor.

3. The method as claimed in claim 1 or 2, characterized in that one or more nerve regeneration factors, preferably nerve growth factor (NGF) and/or one or more vessel regeneration factors, preferably vascular endothelial growth factor (VEGF) and/or platelet derived growth factor (PDGF) are employed in addition.

4. The method as claimed in at least one of claims 1 to 3, characterized in that the method is carried out in the presence of endothelial cells.

5. The method as claimed in at least one of claims 1

to 4, characterized in that the growth process of the cells is locally initiated and terminated, and structurally guided.

6. The method as claimed in claim 5, characterized in that the growth process of the cells is locally initiated and terminated, and structurally guided, by a biological matrix or by a supporting structure.

7. The method as claimed in claim 6, characterized in that the biological matrix or supporting structure is treated with one of said growth factors or with a combination of said growth factors as mixture or sequentially.

8. The method as claimed in claim 6 or 7, characterized in that an implant, a transplant and/or a supporting material is used as biological matrix or as supporting structure for the growth of cells.

9. The method as claimed in at least one of claims 1 to 8, characterized in that the biological matrix or supporting structure has been precolonized with cells, preferably tissue-specific cells, precursor cells, bone marrow cells, peripheral blood, adipose tissue and/or fibrous tissue, or already prepared in vitro for the in vivo colonization or the inductive remodeling.

10. The method as claimed in at least one of claims 1-9, characterized in that adult progenitor cells and/or tissue-specific cells, preferably osteoblasts, fibroblasts, hepatocytes and/or smooth muscle cells, are employed as cells.

11. The method as claimed in at least one of claims 1-10 for locally specific and/or directed

multiplication, structural growth and subsequent differentiation of adult cells and/or for regeneration of bones, tissues and/or endocrine organs.

12. The method as claimed in at least one of claims 1 to 4, characterized in that the cell aggregates which form where appropriate during the growth process are broken up and, where appropriate, encapsulated and, where appropriate, frozen by means of a suitable device.

13. A biological matrix or supporting structure comprising at least one of the growth factors TPO, EPO, GH, especially HGH, somatostatin, LIF and/or CNTF.

14. The biological matrix or supporting structure as claimed in claim 13, additionally comprising at least one of the growth factors TGF beta, prostaglandins, GM-CSF, GHRH, TRH, GnRH, CRH, dopamine, ADH, oxytocin, prolactin, adrenocorticotropin, beta-celltropin, lutrotropin and/or vasopressin and, where appropriate, additionally one or more nerve regeneration factors, preferably NGF and/or one or more vessel regeneration factors, preferably VEGF and/or PDGF.

15. The biological matrix or supporting structure as claimed in claim 13 or 14, characterized in that the biological matrix or supporting structure is an implant, a transplant and/or a supporting material for the growth of cells.

16. The biological matrix or supporting structure as claimed in any of claims 13 to 15, characterized in that the biological matrix or supporting structure is a stent, a patch, a catheter, a skin, a hydrogel, a bone substitute material, an

allogeneic, autologous or xenogeneic, acellularized or non-acellularized tissue, a synthetic tissue, a feeder layer or a fabric.

17. The biological matrix or supporting structure as claimed in any of claims 13 to 16, characterized in that the biological matrix or supporting structure is precolonized with cells, preferably tissue-specific cells, precursor cells, bone marrow cells, peripheral blood, adipose tissue and/or fibrous tissue.

18. The biological matrix or supporting structure as claimed in any of claims 13 to 17, characterized in that the biological matrix or supporting structure is coated with a biodegradable (bio)polymer layer comprising at least one of said growth factors.

19. A method for producing a biological matrix or supporting structure as claimed in at least one of claims 13 to 18, characterized in that an optionally activated biological matrix or supporting structure is coated with at least one of the growth factors TPO, EPO, GH, especially HGH, somatostatin, LIF and/or CNTF.

20. The method as claimed in claim 19, characterized in that said matrix or supporting structure is coated with additionally at least one of the growth factors TGF beta, prostaglandin, GM-CSF, GHRH, TRH, GnRH, CRH, dopamine, ADH, oxytocin, prolactin, adrenocorticotropin, beta-celltropin, lutrotropin and/or vasopressin and, where appropriate, additionally with one or more nerve regeneration factors, preferably NGF and/or one or more vessel regeneration factors, preferably VEGF and/or PDGF.

21. The method as claimed in claim 19 or 20, characterized in that the biological matrix or supporting structure is activated by means of plasma ionization or laser activation.

22. The method as claimed in at least one of claims 19 to 21, characterized in that said biological matrix or supporting structure is precolonized in vitro with cells, preferably tissue-specific cells, precursor cells, bone marrow cells, peripheral blood, adipose tissue and/or fibrous tissue.

23. A device for carrying out a method as claimed in at least one of claims 1 to 12 and 19 to 22.

24. The device as claimed in claim 23, characterized in that the device is a perfused bioreactor, preferably in the form of a closed system.

25. The use of the growth factors TPO and/or EPO and/or GH and/or somatostatin and/or LIF and/or CNTF for producing a medicament for the treatment of the regeneration of bones, cartilage, tissues and/or endocrine organs, in particular of myocardium, heart valves, venous valves, arterial valves, skin, vessels, aortas, tendons, comea, cartilage, bone, tracea, nerves, miniscus, intervertebral disc, liver, intestinal epithelium, ureters, urethra or bladders, and for the treatment of degenerative disorders and/or for assisting the wound-healing process, especially in Crohn's disease, ulcerative colitis and/or in the region of the skin, preferably for diabetic ulcers or gingiva and/or for the treatment of liver disorders, especially of cirrhosis of the liver, hepatitis, acute or chronic liver failure and/or wound healing in the muscle region after sports injuries, muscle disorders, bone injuries, soft-

tissue injuries and/or for improving wound healing and tissue regeneration, for example after operations, acute and chronic disorders and/or ischemic myocardial disorders for stimulating neoangiogenesis and regeneration and/or ischemias after injuries and trauma and/or regeneration of tissues following a tissue injury.

26. The use as claimed in claim 25, characterized in that transforming growth factor beta (TGF beta), prostaglandins, granulocyte-macrophage stimulating factor (GM-CSF), growth hormone releasing hormone (GHRH), thyrotropin-releasing hormone (TRH), gonadotropin-releasing hormone (GnRH), corticotropin-releasing hormone (CRH), dopamine, antidiuretic hormone (ADH), oxytocin, prolactin, adrenocorticotropin, beta-celltropin, lutrotropin and/or vasopressin is used as growth factor in addition.

27. The use as claimed in claim 25 or 26, characterized in that additionally one or more nerve regeneration factors, preferably nerve growth factor (NGF) and/or one or more vessel regeneration factors, preferably vascular endothelial growth factor (VEGF) and/or platelet derived growth factor (PDGF) are used.